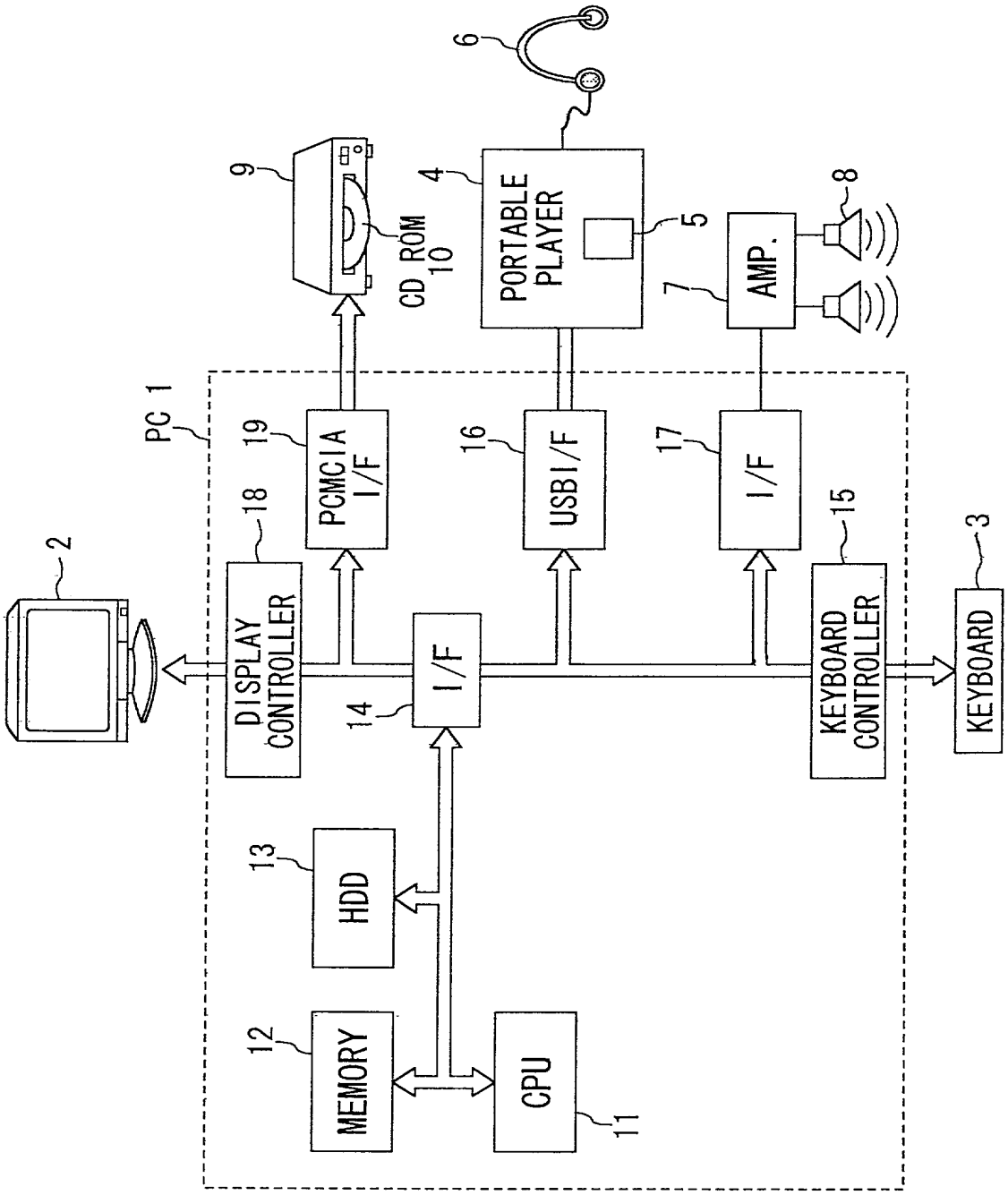

6
9
4
PORTABLE PLAYER
5
8
CD ROM 10
7
AMP.
PC 1
19
PCMCIA I/F
16
USBI/F
17
I/F
2
18
DISPLAY CONTROLLER
15
3
14
I/F
KEYBOARD CONTROLLER
KEYBOARD
13
HDD
12
MEMORY
CPU
11

FIG. 1

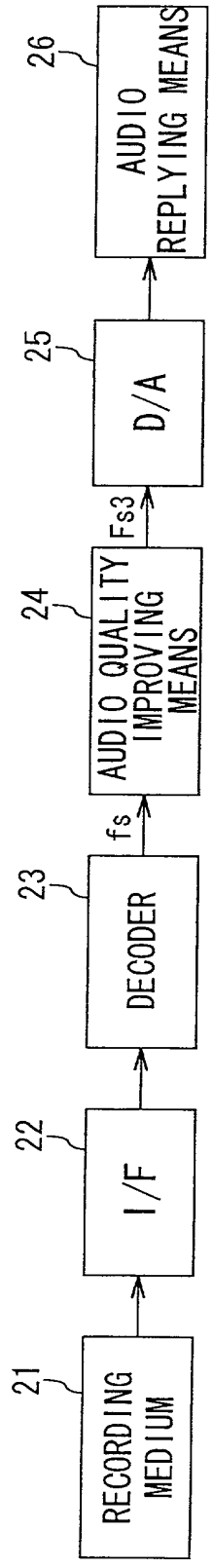

21
RECORDING MEDIUM
22
I/F
23
DECODER
fs
24
AUDIO QUALITY IMPROVING MEANS
Fs3
25
D/A
26
AUDIO REPLYING MEANS

FIG. 2

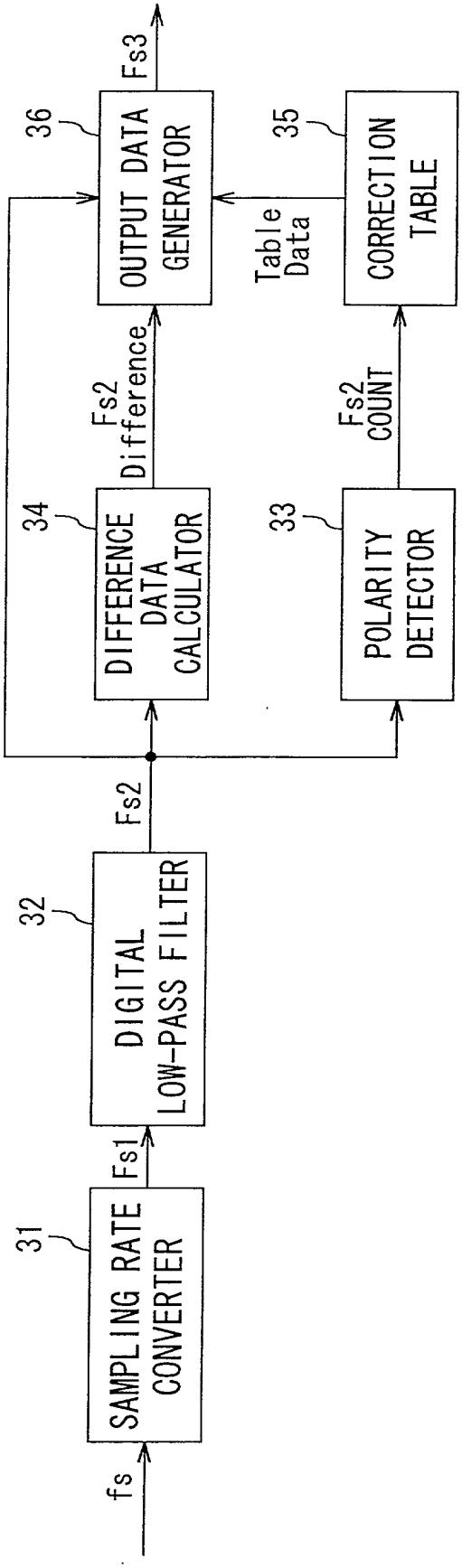

fs
31
SAMPLING RATE CONVERTER
Fs1
32
DIGITAL LOW-PASS FILTER
Fs2
34
DIFFERENCE DATA CALCULATOR
Fs2 Difference
36
OUTPUT DATA GENERATOR
Fs3
33
POLARITY DETECTOR
Fs2 COUNT
35
CORRECTION TABLE
Table Data

FIG. 3

ALGORITHM OF DOUBLE-EXTENDED SAMPLING

INPUT DATA SAMPLED AT RATE = fs	OUTPUT DATA CONVERTED TO RATE=Fs(=2×fs)
m	m
m+1	0
m+2	m+1
m+3	0
· · ·	m+2
	0
	m+3
	0
	· · ·

FIG. 4

CORRECTION TABLE A

Fs2COUNT	3 (=2Fs)	4 (=3Fs)	5 (=4Fs)	6 (=5Fs)
n=1	0	0	0	0
n=2	1/4 (=α)	1/4 (=α)	1/4 (=α)	1/4 (=α)
n=3	-	-1/4 (=β)	0	0
n=4	-	-	-1/4 (=β)	0
n=5	-	-	-	-1/4 (=β)

FIG. 5A

CORRECTION TABLE B

Fs2COUNT	3 (=2Fs)	4 (=3Fs)	5 (=4Fs)	6 (=5Fs)
n=1	0	0	0	0
n=2	-1/4 (=β)	-1/4 (=γ)	-1/4 (=γ)	-1/4 (=γ)
n=3	-	1/4 (=θ)	0	0
n=4	-	-	1/4 (=θ)	0
n=5	-	-	-	1/4 (=θ)

FIG. 5B

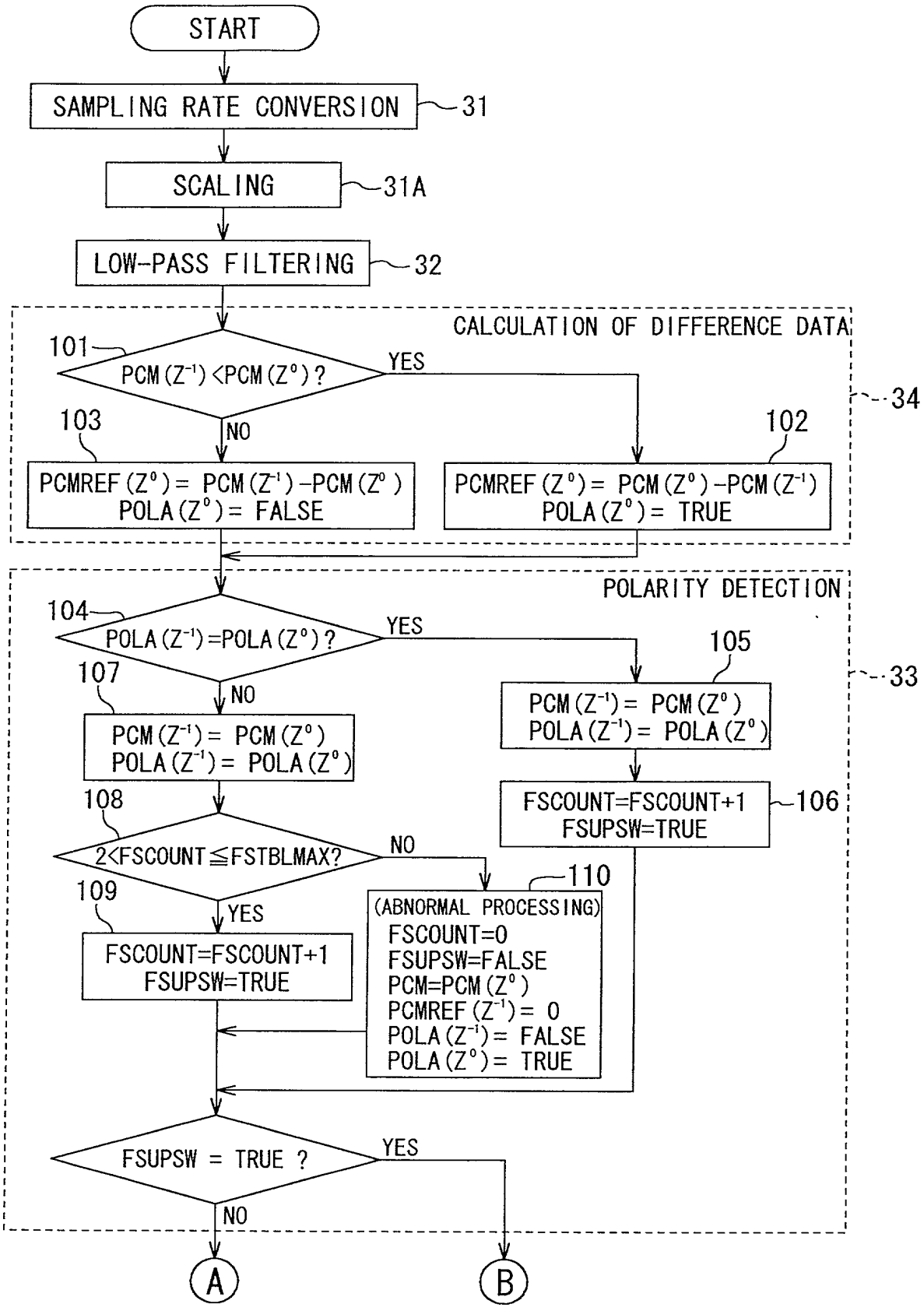

START
SAMPLING RATE CONVERSION
31
SCALING
31A
LOW-PASS FILTERING
32
CALCULATION OF DIFFERENCE DATA
34
101
PCM(Z⁻¹) <PCM(Z⁰)?
YES
NO
103
PCMREF(Z⁰)= PCM(Z⁻¹)-PCM(Z⁰)
POLA(Z⁰)= FALSE
102
PCMREF(Z⁰)= PCM(Z⁰)-PCM(Z⁻¹)
POLA(Z⁰)= TRUE
POLARITY DETECTION
33
104
POLA(Z⁻¹)=POLA(Z⁰)?
YES
NO
105
PCM(Z⁻¹)= PCM(Z⁰)
POLA(Z⁻¹)= POLA(Z⁰)
107
PCM(Z⁻¹)= PCM(Z⁰)
POLA(Z⁻¹)= POLA(Z⁰)
FSCOUNT=FSCOUNT+1
FSUPSW=TRUE
106
108
2<FSCOUNT≦FSTBLMAX?
NO
YES
110
(ABNORMAL PROCESSING)
FSCOUNT=0
FSUPSW=FALSE
PCM=PCM(Z⁰)
PCMREF(Z⁻¹)= 0
POLA(Z⁻¹)= FALSE
POLA(Z⁰)= TRUE
109
FSCOUNT=FSCOUNT+1
FSUPSW=TRUE
FSUPSW = TRUE ?
YES
NO
A
B

FIG. 6

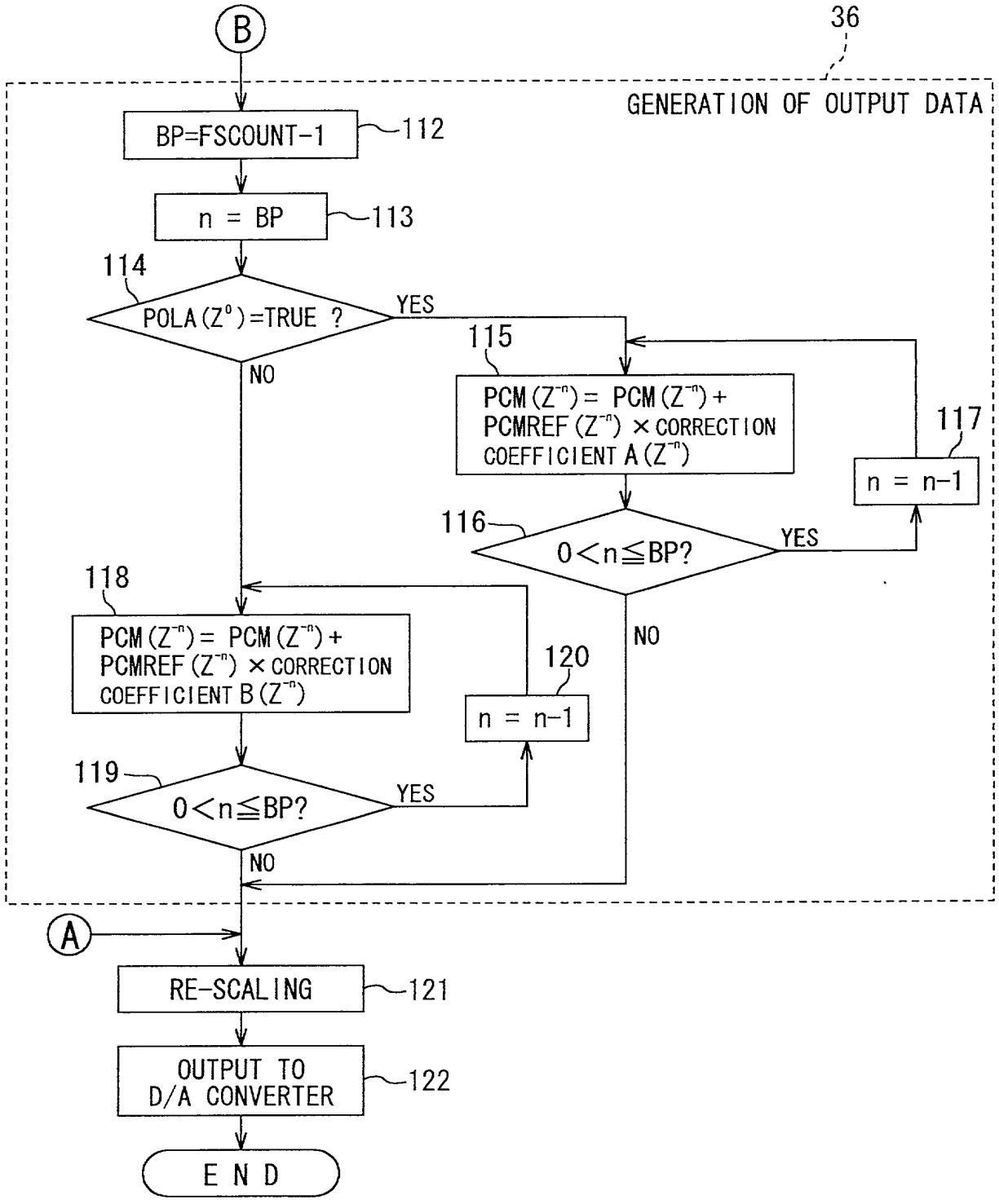
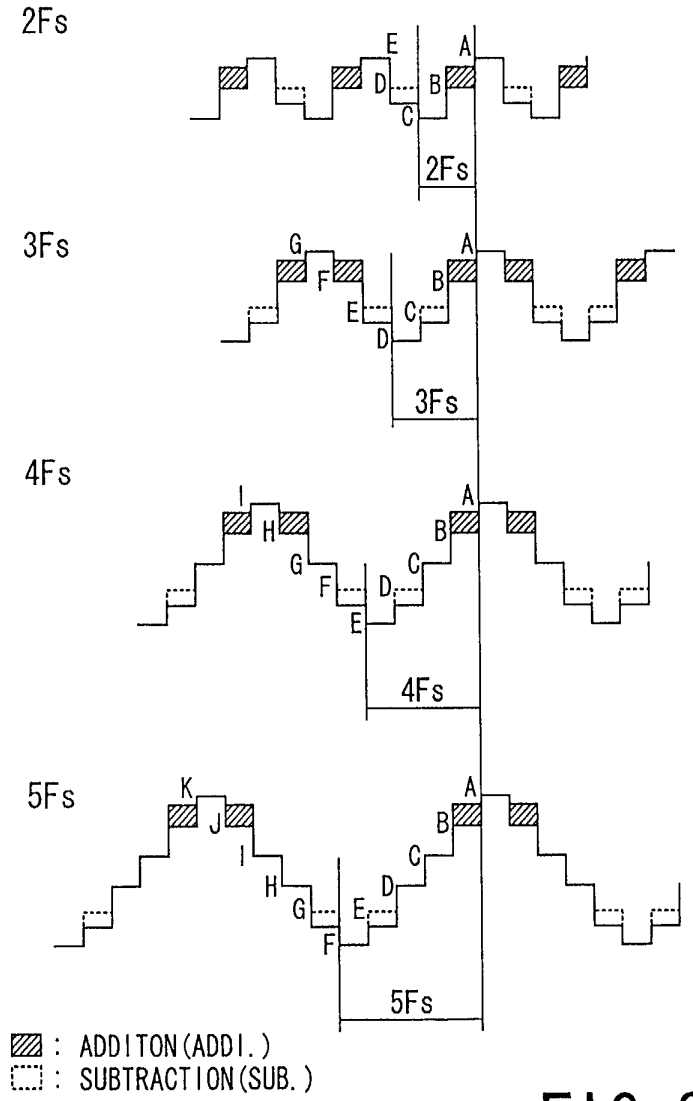

B
36
GENERATION OF OUTPUT DATA
BP=FSCOUNT-1
112
n = BP
113
114
POLA(Z⁰)=TRUE ?
YES
NO
115
PCM(Z⁻ⁿ)= PCM(Z⁻ⁿ)+
PCMREF(Z⁻ⁿ) × CORRECTION
COEFFICIENT A(Z⁻ⁿ)
117
n = n-1
116
0<n≦BP?
YES
NO
118
PCM(Z⁻ⁿ)= PCM(Z⁻ⁿ)+
PCMREF(Z⁻ⁿ) × CORRECTION
COEFFICIENT B(Z⁻ⁿ)
120
n = n-1
119
0<n≦BP?
YES
NO
A
RE-SCALING
121
OUTPUT TO
D/A CONVERTER
122
E N D

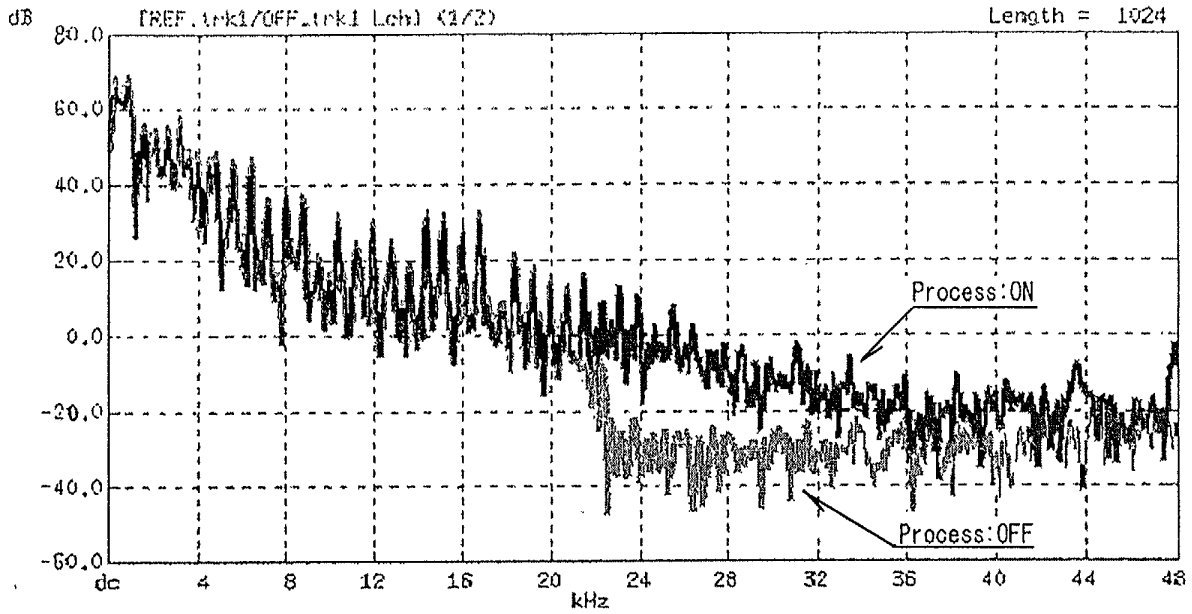
FIG. 7



WHEN CORRECTION VALUES ARE a to d AND VALUES FROM CORRECTION TABLES ARE α to θ:

	OUTPUT PCM DATA:
BP=2Fs a=(ABS(A-B))* α b=(ABS(C-D))* β α=1/4, β=-1/4	A=A B=B+a(ADDI.) C=C D=D+b(SUB.)
BP=3Fs a=(ABS(A-B))* α b=(ABS(C-D))* β c=(ABS(D-E))* γ d=(ABS(F-G))* θ α=1/4, β=-1/4, γ=-1/4, θ=1/4	A=A B=B+a(ADDI.) C=C+b(SUB.) D=D E=E+c(SUB.) F=F+d(ADDI.)
BP=4Fs a=(ABS(A-B))* α b=(ABS(D-E))* β c=(ABS(E-F))* γ d=(ABS(H-I))* θ α=1/2, β=-1/2, γ=-1/2, θ=1/2	A=A B=B+a(ADDI.) C=C D=D+b(SUB.) E=E F=F+c(SUB.) G=G H=H+d(ADDI.) I=I
BP=5Fs a=(ABS(A-B))* α b=(ABS(E-F))* β c=(ABS(F-G))* γ d=(ABS(J-K))* θ α=1/2, β=-1/2, γ=-1/2, θ=1/2	A=A B=B+a(ADDI.) C=C D=D E=E+b(SUB.) F=F G=G+c(SUB.) H=H I=I J=J+d(ADDI.) K=K

FIG. 8



OUTPUT LEVELS OF SPECTRUM ANALYZER

[UPPER(ON) :WITH VOICE-QUALITY IMPROVEMENT PROCESSING
LOWER(OFF):WITHOUT VOICE-QUALITY IMPROVEMENT PROCESSING]

FIG. 9

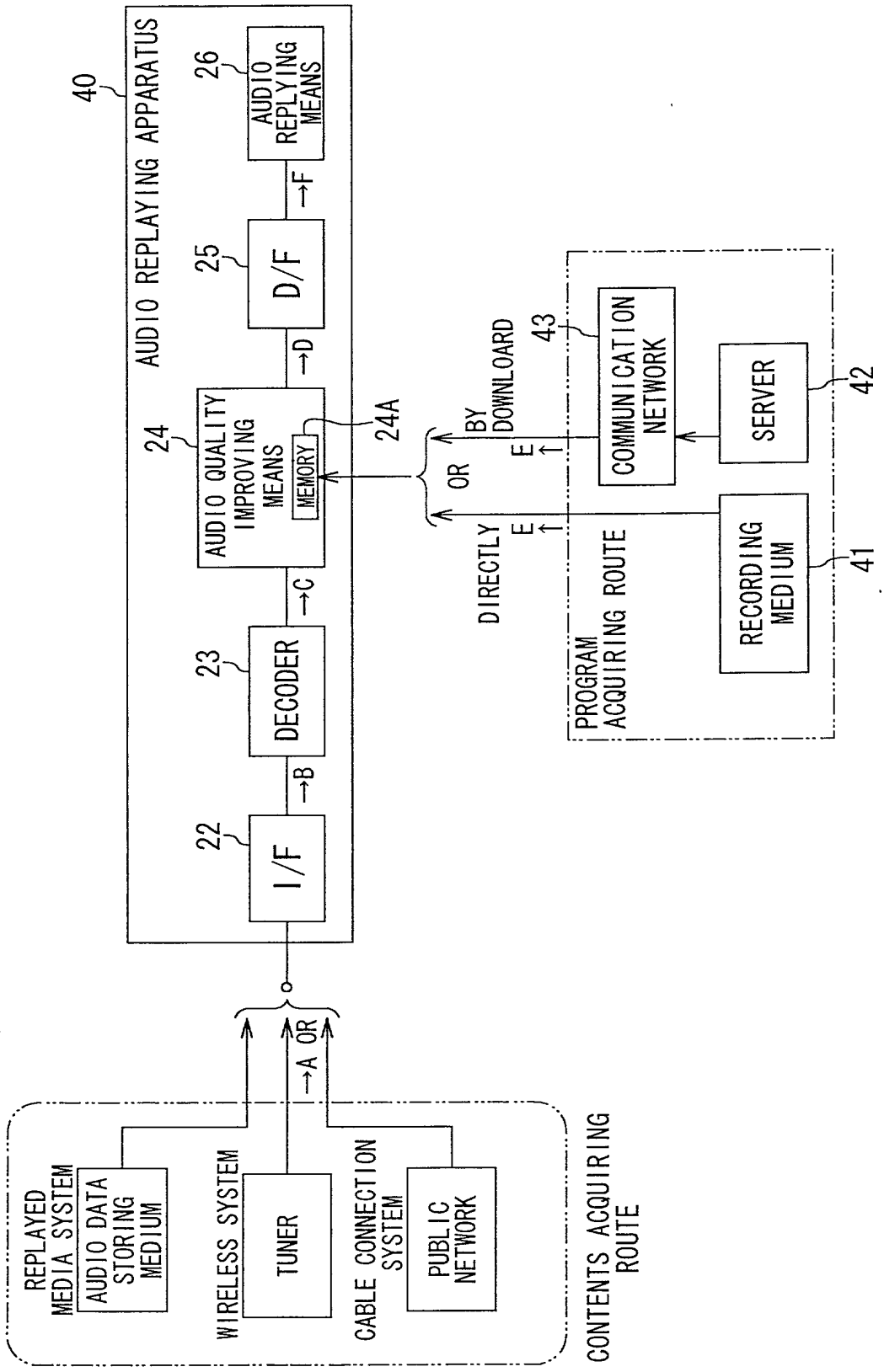

40
AUDIO REPLAYING APPARATUS
22
I/F
23
DECODER
24
AUDIO QUALITY IMPROVING MEANS
MEMORY
24A
25
D/F
26
AUDIO REPLYING MEANS
→A
→B
→C
→D
→F
OR
REPLAYED MEDIA SYSTEM
AUDIO DATA STORING MEDIUM
WIRELESS SYSTEM
TUNER
CABLE CONNECTION SYSTEM
PUBLIC NETWORK
CONTENTS ACQUIRING ROUTE
DIRECTLY
E
BY DOWNLOARD
E
43
COMMUNICATION NETWORK
SERVER
42
RECORDING MEDIUM
41
PROGRAM ACQUIRING ROUTE

FIG. 10

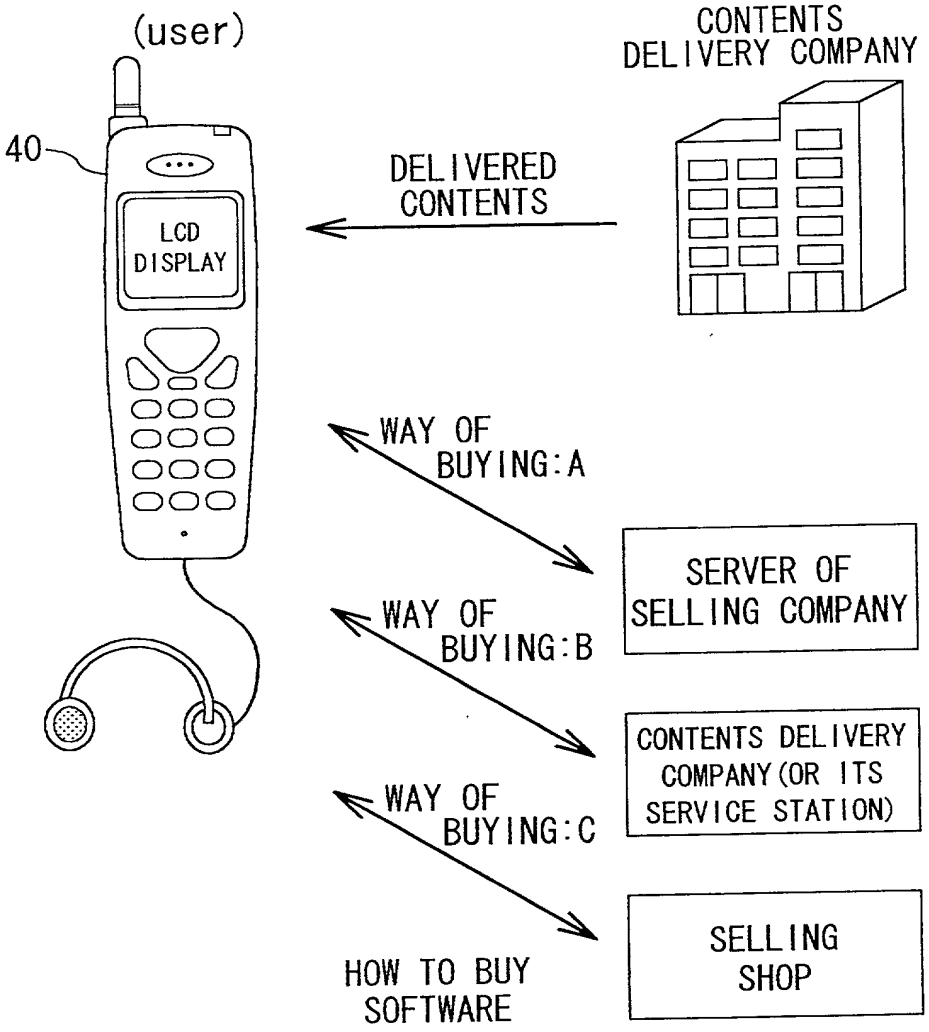

(user)
40
LCD DISPLAY
CONTENTS DELIVERY COMPANY
DELIVERED CONTENTS
WAY OF BUYING:A
SERVER OF SELLING COMPANY
WAY OF BUYING:B
CONTENTS DELIVERY COMPANY(OR ITS SERVICE STATION)
WAY OF BUYING:C
SELLING SHOP
HOW TO BUY SOFTWARE

FIG. 11